ABSTRACT

The invention discloses a multifunctional apparatus and method to manufacture mineral (basalt) fibers to be drawn / attenuated into a continuous strand made from natural rock basalts with and without supplemental minerals. More specifically this invention discloses apparatus designed to manufacture a high quality continuous amorphous mineral (basalt) fibers with flexible/ductile properties from 7 μm to 100 μm in diameter without traces of crystalline phases which are suitable for a variety of industrial applications. The key members of apparatus are designed to provide a sequence of operations such as: mineral (basalt) rock melting in fore-chambers or retorts; volatile elements degasing and glass body mixing caused by glass body turbulence when flowing through the multi-zone sloped and in special configurations through horizontal valleys toward the collector; glass body homogenization at the collector - glass body receiver; additional glass body overheating inside upper chamber of two-chamber ceramic bushing utilizing either external induction or internal cathode-anode heating which is provided to decompose the stable complex oxides of minerals; glass body viscosity adjustment at the lower chamber of bushing and fiber formation beneath discharge wall containing orificed ceramic plates. A heat transfer water cooled fin shields conduit consisting a wall made from refractory TiNi which is a water vapor permeable porous material allowing the manufacture of amorphous fibers to be drawn /attenuated at a suitable moisture environment.